

RANUNCULUS FICARIA (RANUNCULACEAE), NEW TO
NORTH CAROLINA AND AN UPDATED KEY
TO CAROLINA CONGENERS

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ABSTRACT

Populations of the expanding exotic *Ranunculus ficaria* L. (Ranunculaceae) are reported escaped in North Carolina. Voucher specimens are cited and an updated key to *Ranunculus* L. in the Carolinas is presented.

RESUMEN

Poblaciones de la exótica en expansión *Ranunculus ficaria* L. (Ranunculaceae), se citan escapadas en Carolina del Norte. Se citan los especímenes y se presenta una clave actualizada de *Ranunculus* L. en las Carolinas.

Populations of the exotic *Ranunculus ficaria* L. (lesser celandine) are known outside of cultivation from the northeastern United States, Oregon, and Washington (Gleason & Cronquist 1991; USDA, NRCS 2005), but the species has been previously collected in the Southeast only in Kentucky, Tennessee, Virginia, and Maryland (Whittemore 1997). *Ranunculus ficaria* is native to much of Europe (Tutin 1976; Taylor & Markham 1978). The species was reported in New York State as early as 1890 (Hollick & Britton 1891). By the mid 1940s, it was known from several northeastern coastal states, as well as Virginia (Sargent s.n., NCSC), but had not yet reached West Virginia (Bell 1945). The taxon was not previously reported for North Carolina by Radford et al. (1968), Pittillo et al. (1969), Pittillo et al. (1972), Kral (1981), Pittillo and Brown (1988), or Whittemore (1997). However, a population of the species was recently encountered in Raleigh (Wake Co., North Carolina). Twenty-nine clumps were observed, of which seventeen were either in flower or fruit at the time of collection. Individuals were observed

only in areas receiving partial shade for a significant portion of the day. They were absent from portions of the lawn receiving full sunlight.

Voucher collection **U.S.A. North Carolina. Wake Co.:** Raleigh, backyard lawn of residential home on Van Dyke Avenue, in partial shade, absent from portions of lawn receiving full sun, 11 Apr 2005, Krings, I271 (AUA, E.F.LAS, GA, LSU, MISS, NCSC, NCU, TEX, UNA, US, USE, USCH, VDB).

The species has also been observed on a private property in Chatham Co., where it had apparently been planted in the past, but is now escaping short distances into nearby natural areas. Due to summer senescence, vouchers of this population have not been taken this year.

Several attempts have been made to morphologically distinguish diploid from polyploid plants of *R. ficaria* (Marsden-Jones 1935; Marsden-Jones & Turrill 1952; Lawalr e 1955). Unfortunately, most of these have proven unreliable (Heywood & Walker 1961; Jones 1966; Taylor & Markham 1978). Arguing that too great a reliance had been placed on chromosome counts, Sell (1994) recognized five subspecies (Table 1), with the caution that these taxa could be recognized with ease only if cultivated or examined at intervals through their flowering and fruiting periods. If only seen once in the field or from a single specimen, certain identification would remain difficult. The following key was provided by Sell (1994) to facilitate identification:

1. Leaf blades to 8 × 9 cm; petioles to 28 cm; flowers to 60 mm diam; achenes to 5.0 × 3.5 mm
 2. Stems rather robust, but straggling; bulbils present in leaf axils after flowering _____ subsp. **ficariiformis**
 2. Stems robust and erect; without bulbils in leaf axils after flowering _____ subsp. **chrysocephalus**
1. Leaf blades to 4 × 4 cm; petioles to 15 cm; flowers to 40 mm diam; achenes to 3.5 × 2.2 mm
 3. Leaves crowded at base with few on short stems _____ subsp. **calthifolius**
 3. Leaves less crowded at base and more numerous on the elongate stems
 4. Bulbils not present in leaf axils after flowering; achenes well-developed _____ subsp. **ficaria**
 4. Bulbils present in leaf axils after flowering; achenes poorly developed _____ subsp. **bulbilifer**

USDA, NRCS (2005) reported only *R. ficaria* var. *bulbifera* Marsden-Jones for the United States. Sell (1994) pointed out that this name is illegitimate, being a later homonym of *R. ficaria* var. *bulbifer* Albert, which Sell treated in synonymy under subsp. *bulbilifer* Lambinon. Based on Whittemore's (1997) description of the species, the flower sizes of individuals of subsp. *bulbilifer* in the United States would be on the upper end compared with European individuals as recognized by Sell (1994) (Table 1).

Following Sell (1994), the individuals of the Wake Co., North Carolina population are tentatively referable to subsp. *ficariiformis* (F.W. Schwartz) Rouy & Fouc, previously not reported for the United States. Though there are some more

TABLE 1. The five subspecies of *Ranunculus ficaria* L. recognized by Sell (1994). Fls=flowers; ptio=petioles; ptls=petals.

subsp. <i>bulbilifer</i> Lambinon	subsp. <i>calthifolius</i> (Reichenb.) Arcangeli	subsp. <i>chrysocephalus</i> P.D. Sell	subsp. <i>ficariiformis</i> (F.W. Schultz) Rouy & Fouc.	subsp. <i>ficaria</i>
Tetraploid Ptio \leq 15 cm long Axillary bulbils globular	Diploid Ptio \leq 7 cm long Axillary bulbils absent	Tetraploid Ptio \leq 21 cm long Axillary bulbils absent	Tetraploid Ptio \leq 28 cm long Axillary bulbils ovoid or globular	Diploid Ptio \leq 15 cm long Axillary bulbils absent
Fls \leq 25 mm diam Ptls 6–11 \times 2–5 mm, not contiguous	Fls \leq 30 mm diam Ptls 10–15 \times 2.5–6 mm, not contiguous	Fls \leq 60 mm diam Ptls 18–25 \times 9–15(–18)mm, contiguous or overlapping	Fls \leq 50 mm diam Ptls 17–26 \times 4–12 mm, contiguous or overlapping	Fls 20–40 mm diam Ptls 10–20 \times 4–9 mm, often contiguous
Occurs through- out most range of the species, although rare in Mediterranean region	Restricted to east- central and south- eastern Europe	Occurs in the eastern Mediterranean region	Occurs in the central and western Mediterranean Region	Restricted to western Europe

diminutive plants in the population, a number of individuals bear leaves $>$ 4 cm diam and petals \geq 17×6 mm, that are contiguous to overlapping (see Table 1 for a comparison of characters among subspecies). On some plants, ellipsoid axillary bulbils are evident. However, subspecific taxa of *R. ficaria* are not uniformly accepted. Citing extensive intergradation in form, Whittemore (1997) did not recognize any subspecific taxa in his treatment of *Ranunculus* L. for the *Flora of North America*. To help address the continuing disparity in taxonomic treatments, detailed studies are needed to examine the distribution of haplotypes and potential morphological correlations. Such an approach has been useful for other expanding exotic plants (e.g., Saltonstall 2002, 2003a–c; Saltonstall et al. 2004). Further investigation is also needed to determine more precisely the timing and mode of introduction, as well as the rate of spread of the species. Survey of herbarium collections may shed more light on this matter. Pertinent studies regarding the life history, pollination biology, and ecology have been published by Marsden-Jones (1935, 1936) and Taylor and Markham (1978).

To improve collections, Sell (1994) suggested that specimens should be taken late when fruit and bulbils are developed. However, at this stage any flowers remaining open are typically late ones, which are generally smaller than

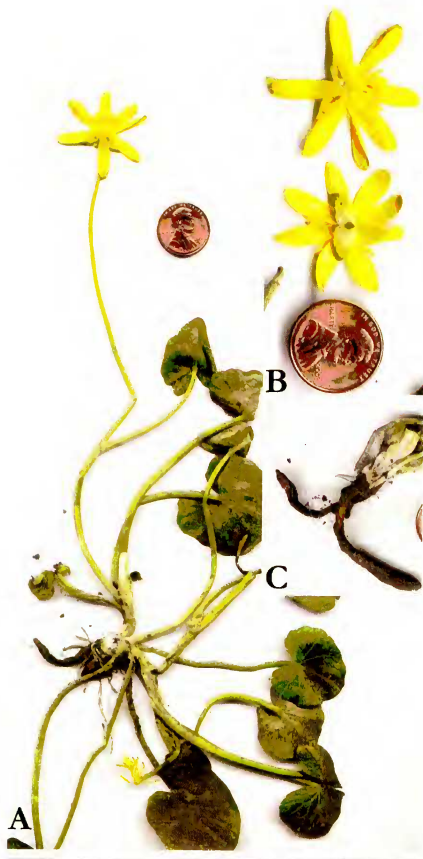


FIG. 1. *Ranunculus ficaria* L. A. Habit; B. Flowers; C. Tuberos roots. Based on Krings 1271.

those when the plant first came into flower. To improve our understanding of the distribution and ecology of subspecies, botanists should note flower sizes on an initial visit to populations and then check the bulbils and fruits at a later date (Sell 1994).

Ranunculus ficaria (Fig. 1) can be distinguished from its Carolina congeners by the combination of unlobed, reniform to suborbicular leaves, tuberous roots, typically three sepals, yellow petals ≥ 10 mm long (sometimes partially fading to white with age), and pubescent, beakless achenes. An updated key to Carolina congeners, largely adapted from Whittemore (1997), is provided below. Following arguments presented by Nesom (1993), we diverge from Whittemore (1997) in treating *R. carolinianus* DC. as a species, rather than as a variety of *R. hispidus* Michx. Distribution, habitat, and frequency information follows Weakley (2005) (Mt = Mountains; Pd = Piedmont; Cp = Coastal Plain). Unless otherwise indicated, provincial distributions and comments apply equally to North Carolina (NC) and South Carolina (SC). Asterisks indicate exotic species.

KEY TO *RANUNCULUS* IN THE CAROLINAS

1. All leaves unlobed
 2. Leaf blades reniform to suborbicular or orbicular, bases shallowly to deeply cordate.
 3. Roots tuberous; petals ≥ 10 mm long; achenes pubescent, beaks absent
 _____ ****R. ficaria*** L. [Pd (NC); disturbed rich forests and bottomlands, mesic suburban forests, lawns, naturalized locally from horticultural plantings; rare]
 3. Roots filiform; petals ≤ 3.5 mm long; achenes glabrous, beaks subulate, curved
 _____ ***R. abortivus*** L. [Mt, Pd, Cp; low fields, disturbed areas, bottomlands, lawns, roadsides; uncommon]
 2. Leaf blades ovate to lanceolate, bases truncate, rounded-obtuse to cuneate (sometimes cordate in *R. laxicaulis*, then petals 2–6 mm long).
 4. Petals 1–3, 1.5–2 mm long _____ ***R. pusillus*** Poir. [Mt (NC), Pd, Cp; marshes, ditches, other wet habitats; common (uncommon in Mt)]
 4. Petals 4–6, 5–8 mm long
 5. Proximal cauline leaf blades 5.9–12.2 cm long; petals 5; achenes to 1.8 mm long _____ ***R. ambigens*** S. Wats. [Pd (NC), Cp (NC); marshes; rare]
 5. Proximal cauline leaf blades to 5.7 cm long; petals 4–6; achenes 0.8–1 mm long _____ ***R. laxicaulis*** (Torr. & A. Gray) Darby [Cp; marshes; rare]
1. All or some leaves lobed or compound.
 6. Leafy stems creeping and rooting at the nodes, or floating in water (then rootless).
 7. Leaves 3-foliolate.
 8. Achene margins 0.4–1.2 mm wide _____ ***R. carolinianus*** DC. [Mt, Pd, Cp; swamp forests, wet woodlands, open marshy wetlands; uncommon]

8. Achene margins 0.1–0.2 mm wide _____ ***R. repens** L. [Mt (NC), Pd (NC), Cp; low meadows, disturbed areas; uncommon]
7. Leaves simple, lobed, parted, or dissected.
9. Leaves \leq 1 cm long; floral receptacles glabrous; petals white; achenes \leq 1.6 mm long _____ **R. hederaceus** L. [Cp; coastal brackish marshes, other circumneutral soils; rare]
9. Leaves \geq 1.2 cm long; floral receptacles sparsely hispid; petals yellow; achenes \geq 1.8 mm long _____ **R. flabellaris** Raf. [Cp (NC); pools in floodplains of small stream swamps, other stagnant or slow moving waters; rare]
6. Leafy stems erect or if decumbent rooting only at the base (rarely rooting at the nodes in *R. sceleratus*), never floating.
10. Style absent; achene margins thick and corky, emergent aquatic or on wet soil _____ **R. sceleratus** L. [Pd (NC), Cp; marshes, ditches, and stream margins; uncommon]
10. Style present; achene margins not corky; various habitats, but not aquatic.
11. Basal leaves variously unlobed to deeply divided; achenes thick-lenticular or asymmetrically thick-lenticular to compressed-globose, 1.2–2 times as wide as thick.
12. Stems villous _____ **R. micranthus** Nutt. [Pd (NC); rich forests; rare]
12. Stems glabrous.
13. Sepals glabrous; achene beaks 0.1–0.2 mm long _____ **R. abortivus** L. [Mt, Pd, Cp; low fields, disturbed areas, bottomlands, lawns, roadsides; uncommon]
13. Sepals hispid; achene beaks 0.6–1 mm long _____ **R. alleghaniensis** Britton [Mt (NC, SC?); cove forests, rich forested slopes; uncommon]
11. Basal leaves always deeply lobed or compound; achenes strongly compressed, at least 3–15 times as wide as thick.
14. Achenes spinose or papillose (sometimes smooth in *R. sardous*).
15. Petals 1–2 mm long; receptacles glabrous; achenes finely papillate, each with a hooked bristle.
16. Flowers pedicellate; sepals 5 _____ ***R. parviflorus** L. [Mt, Pd, Cp; disturbed areas; common (rare in Mt)]
16. Flowers sessile; sepals 3 _____ ***R. platensis** Spreng. [Pd (NC); lawns and ditches; rare]
15. Petals 4–10 mm long; receptacles pilose or hispid; achenes coarsely papillate (but not terminating in hooked bristles), spinose, or tuberculate.
17. Sepals spreading; achenes 5–9, borne in a single whorl, long-spinose _____ ***R. arvensis** L. [Mt (NC), Pd; fields, disturbed areas; rare]
17. Sepals reflexed; achenes 13–60, borne in ovoid or globose heads, papillose to spinose.
18. Basal leaves simple; achene beaks 2–2.5 mm long _____ ***R. muricatus** L. [Pd (SC), Cp (SC); ditches and marshes; rare]
18. Basal leaves compound; achene beaks to 0.7 mm long.

19. Petals 7–10 mm long; achenes sparsely papillate or sometimes smooth _____ ***R. sardous** Crantz [Pd, Cp; low fields, disturbed areas; uncommon]
19. Petals 4–5 mm long; achenes densely tuberculate _____ ***R. trilobus** Desf. [Cp (SC); fields, roadsides, ditches; rare]
14. Achenes smooth, glabrous or pubescent.
20. Petals 3–5 mm long; achene beaks markedly recurved _____ **R. recurvatus** Poir. [Mt, Pd, Cp; bottomland forests, cove forests, swamps, mesic slope forests; common]
20. Petals ≥ 7 mm long; achene beaks more or less straight, not markedly recurved.
21. Sepals reflexed along a defined fold 1–3 mm above base.
22. Stem bases bulbous, corm-like; petals 9–13 mm \times 8–11 mm _____ ***R. bulbosus** L. [Mt, Pd, Cp; fields, roadsides, disturbed areas; common (rare in South Carolina)]
22. Stem bases not bulbous; petals 7–10 \times 4–8 mm _____ ***R. sardous** Crantz [Pd, Cp; low fields, disturbed areas; uncommon]
21. Sepals spreading (sometimes reflexed from base with age).
23. Basal leaf blades 3–5-parted, pentagonal in outline _____ ***R. acris** L. [Mt (NC), Pd (NC), Cp; pastures, fields, roadsides, disturbed areas; common (uncommon in Pd, rare in Cp)]
23. Basal leaf blades 3–5-foliolate, ovate to deltate in outline.
24. Tuberos roots absent _____ **R. hispidus** Michx. [Mt, Pd; rich moist forests, creek banks, mesic to dry woodlands and forests, bottomlands; common]
24. Tuberos roots present _____ **R. fascicularis** Muhl. ex Bigelow [Mt (NC), Pd; wet flats with prairie affinities, rocky barrens and glades over mafic rocks, ultramafic outcrop barrens, limestone barrens; rare]

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